



SEMITRANS® 10

IGBT M7 Modules

SKM1800GB12M7ST

Features*

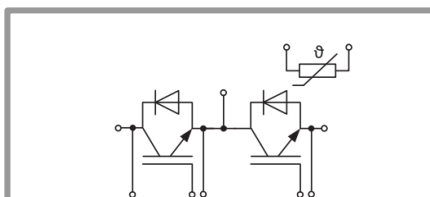
- $V_{CE(sat)}$ with positive temperature coefficient
- High overload capability
- Symmetrical current sharing
- Low-inductive module design
- High mechanical robustness
- Low loss high density IGBT's
- Fast & soft switching inverse CAL diodes
- UL recognized, file no. E63532

Typical Applications

- Motor Drives
- UPS Systems
- Solar Inverters

Remarks

- Max. case temperature limited to $T_c = T_s = 125^\circ\text{C}$
- Recommended $T_{jop} = -40 \dots +150^\circ\text{C}$
- $I_{DC} \leq 1000\text{ A}$ for $T_{Terminal} = 100^\circ\text{C}$



GB

Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
IGBT				
V _{CES}	T _j = 25 °C		1200	V
I _C	T _j = 175 °C	T _c = 25 °C	2475	A
		T _c = 100 °C	1629	A
I _{Cnom}			1800	A
I _{CRM}			3600	A
V _{GES}			-20 ... 20	V
t _{psc}	V _{CC} = 800 V V _{GE} ≤ 15 V V _{CES} ≤ 1200 V	T _j = 150 °C	8	µs
T _j			-40 ... 175	°C
Inverse diode				
V _{RRM}	T _j = 25 °C		1200	V
I _F	T _j = 175 °C	T _c = 25 °C	2219	A
		T _c = 100 °C	1404	A
I _{FRM}			3600	A
I _{FSM}	t _p = 10 ms, sin 180°, T _j = 25 °C		7296	A
T _j			-40 ... 175	°C
Module				
I _{t(RMS)}			1000	A
T _{stg}			-40 ... 150	°C
V _{isol}	AC sinus 50 Hz, t = 1 min		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
V _{CE(sat)}	I _C = 1800 A V _{GE} = 15 V chipelevel	T _J = 25 °C		1.55	1.88	V
		T _J = 150 °C		1.80	2.37	V
V _{CE0}	chipelevel	T _J = 25 °C		0.87	0.95	V
		T _J = 150 °C		0.76	0.91	V
r _{CE}	V _{GE} = 15 V chipelevel	T _J = 25 °C		0.38	0.52	mΩ
		T _J = 150 °C		0.58	0.81	mΩ
V _{GE(th)}	V _{CE} = 10V, I _C = 180 mA		5.4	6.0	6.6	V
I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V, T _J = 25 °C				5.0	mA
C _{ies}	V _{CE} = 10 V V _{GE} = 0 V	f = 1 MHz		360.0		nF
C _{oes}		f = 1 MHz		10.97		nF
C _{res}		f = 1 MHz		3.84		nF
Q _G	V _{GE} = - 8 V / + 15 V			17310		nC
R _{Gint}	T _J = 25 °C			0.3		Ω
t _{d(on)}	V _{CC} = 600 V I _C = 1800 A V _{GE} = +15V/-15V R _{Gon} = 1 Ω R _{Goff} = 0.5 Ω di/dt _{on} = 9.2 kA/μs di/dt _{off} = 12.8 kA/μs dv/dt = 5406 V/μs L _S = 15 nH	T _J = 150 °C		498		ns
t _r		T _J = 150 °C		195		ns
E _{on}		T _J = 150 °C		287		mJ
t _{d(off)}		T _J = 150 °C		694		ns
t _f		T _J = 150 °C		117		ns
E _{off}		T _J = 150 °C		232		mJ
R _{th(j-c)}	per IGBT				0.023	K/W
R _{th(c-s)}	per IGBT, (λ _{grease} = 0.81 W/(m*K))			0.012		K/W
R _{th(c-s)}	per IGBT, pre-applied phase change material			0.006		K/W

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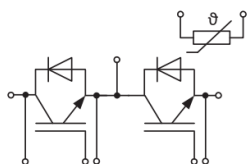
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- Max. case temperature limited to $T_c = T_s = 125\text{ °C}$
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- $I_{DC} \leq 1000\text{ A}$ for $T_{Terminal} = 100\text{ °C}$

Characteristics					
Symbol	Conditions	min.	typ.	max.	Unit
Inverse diode					
$V_F = V_{EC}$	$I_F = 1800\text{ A}$ $V_{GE} = 0\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	1.80	2.13	V
		$T_j = 150\text{ °C}$	1.83	2.17	V
V_{F0}	chipelevel	$T_j = 25\text{ °C}$	1.19	1.40	V
		$T_j = 150\text{ °C}$	0.97	1.10	V
r_F	chipelevel	$T_j = 25\text{ °C}$	0.34	0.40	mΩ
		$T_j = 150\text{ °C}$	0.48	0.60	mΩ
I_{RRM}	$I_F = 1800\text{ A}$	$T_j = 150\text{ °C}$	1067		A
Q_{rr}	$di/dt_{off} = 9.9\text{ kA/μs}$ $V_{GE} = -15\text{ V}$	$T_j = 150\text{ °C}$	338		μC
E_{rr}	$V_{CC} = 600\text{ V}$	$T_j = 150\text{ °C}$	140		mJ
$R_{th(j-c)}$	per diode			0.036	K/W
$R_{th(c-s)}$	per diode, ($\lambda_{grease} = 0.81\text{ W/(m}^2\text{K)}$)		0.017		K/W
$R_{th(c-s)}$	per diode, pre-applied phase change material		0.009		K/W
Module					
L_{CE}			10		nH
R_{CC+EE}	measured per switch, $T_c = 25\text{ °C}$		0.20		mΩ
$R_{th(c-s)1}$	calculated without thermal coupling ($\lambda_{grease}=0.81\text{ W/(m}^2\text{K)}$)		0.0019		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module ($\lambda_{grease}=0.81\text{ W/(m}^2\text{K)}$)		0.003		K/W
$R_{th(c-s)2}$	including thermal coupling, T_s underneath module, pre-applied phase change material		0.002		K/W
M_s	to heat sink M5	4		6	Nm
M_t	to terminal M8	8		10	Nm
	to terminal M4	1.8		2.1	Nm
w				1250	g
Temperature Sensor					
R_{100}	$T_c=100\text{ °C}$ ($R_{25}=5\text{ kΩ}$)		493 ± 5 %		Ω
$B_{100/125}$	$R(T)=R_{100}\exp[B_{100/125}(1/T-1/T_{100})]$; $T[K]$;		3550 ± 2 %		K



GB

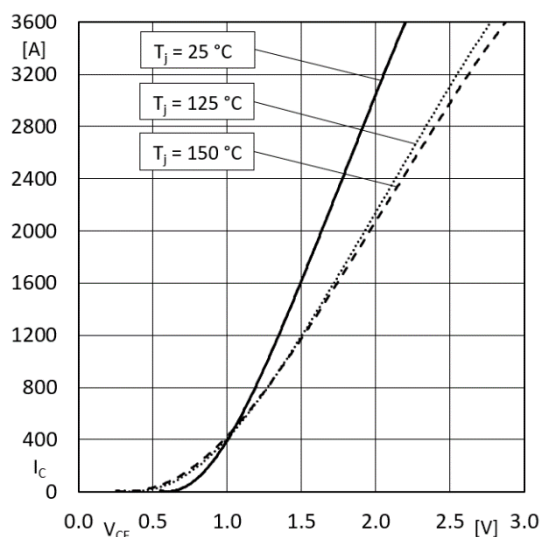


Fig. 1: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $V_{GE} = 15 \text{ V}$; (chipsevel)

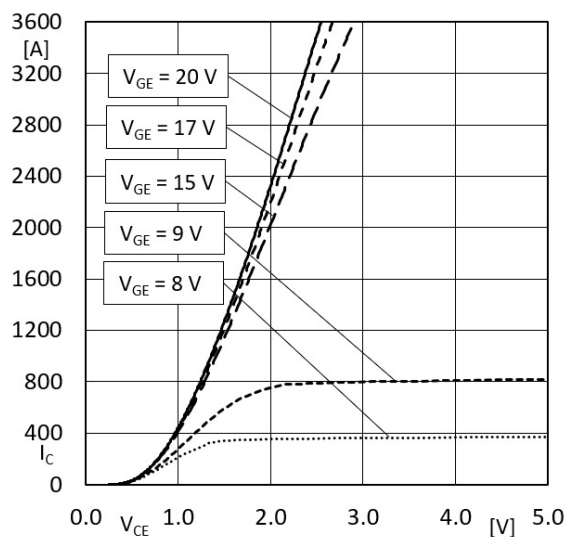


Fig. 2: Output characteristics IGBT (typical); $I_C = f(V_{CE})$; $T_J = 150^\circ\text{C}$; (chipsevel)

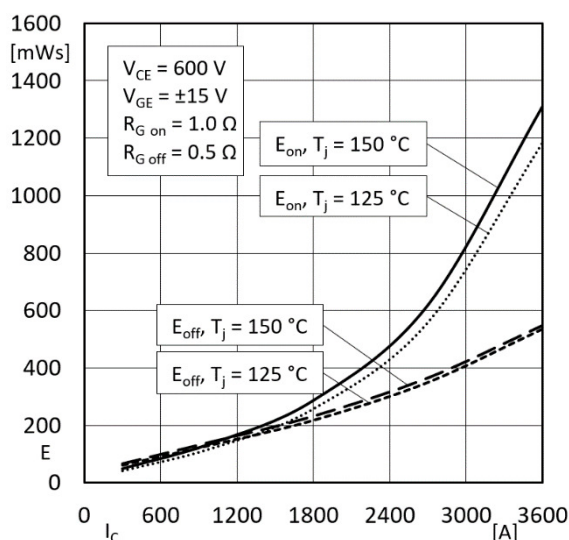


Fig. 3: Switching losses IGBT (typical); $E = f(I_C)$

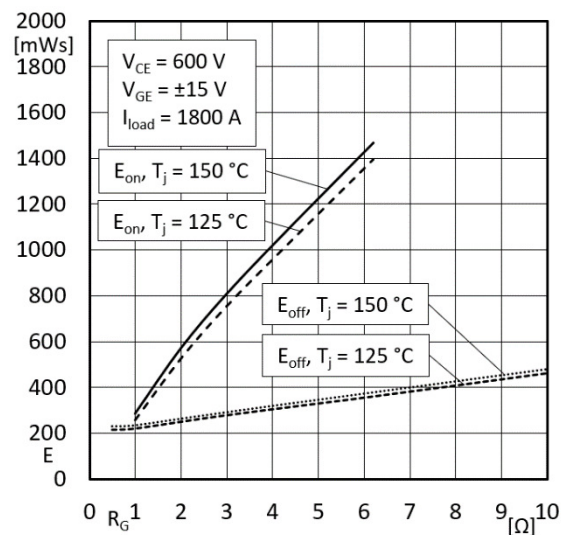


Fig. 4: Switching losses IGBT (typical); $E = f(R_G)$

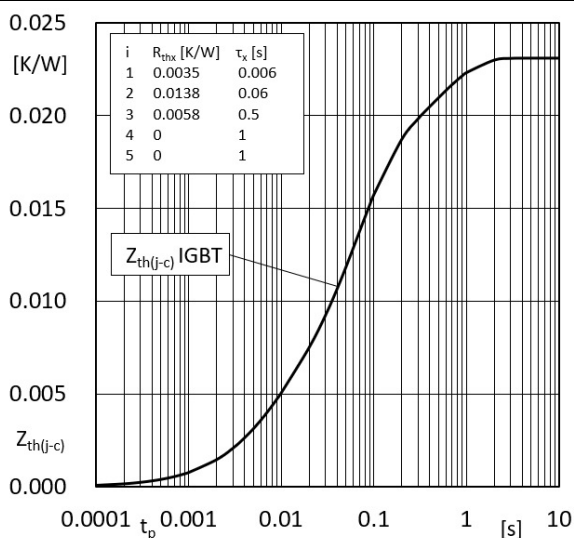


Fig. 5: Transient thermal impedance IGBT

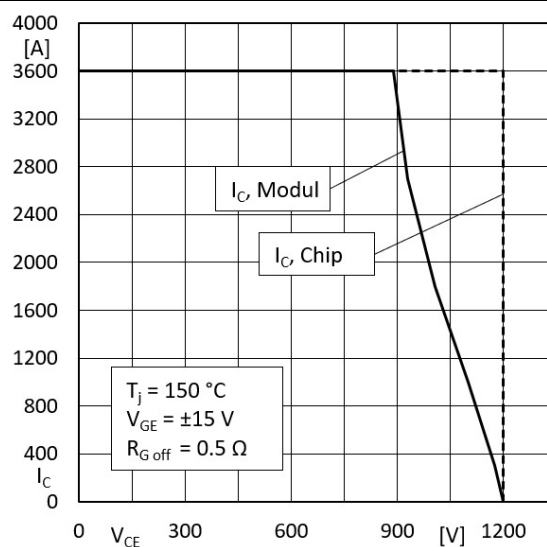


Fig. 6: RBSOA IGBT

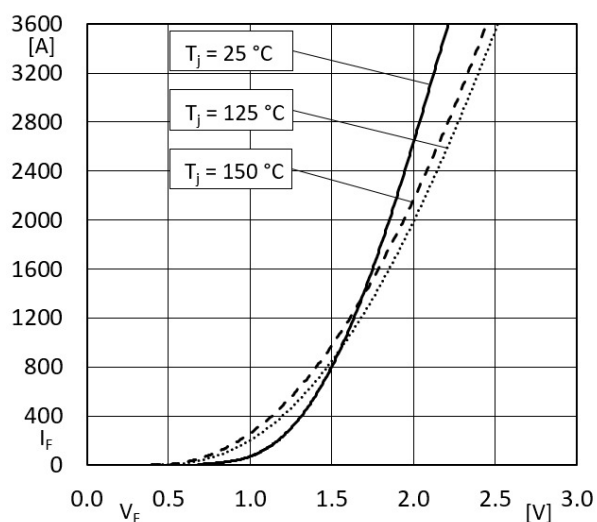


Fig. 7: Forward characteristics Diode (typical), $I_F = f(V_F)$; (chipllevel)

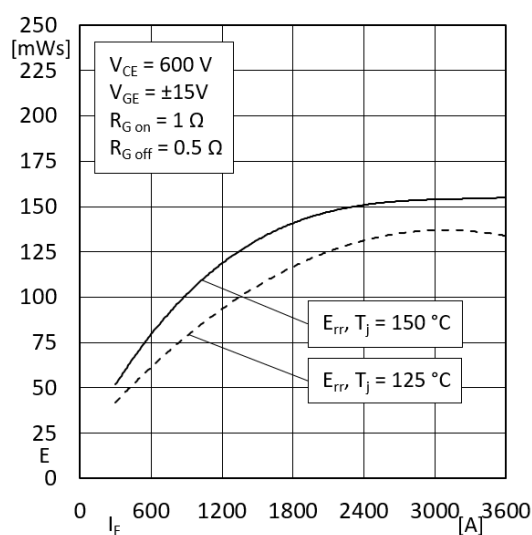


Fig. 8: Switching losses Diode (typical); $E = f(I_F)$

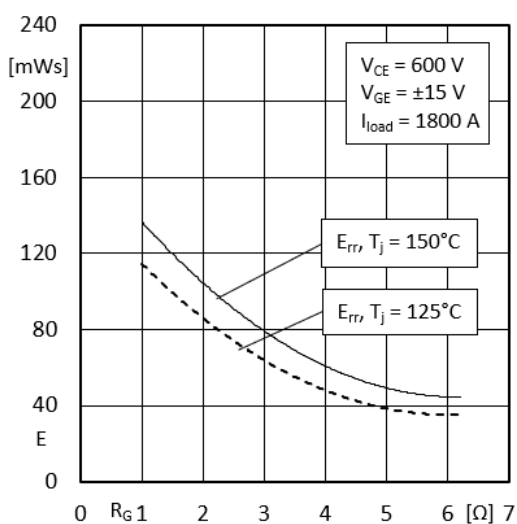


Fig. 9: Switching losses Diode (typical); $E = f(R_G)$

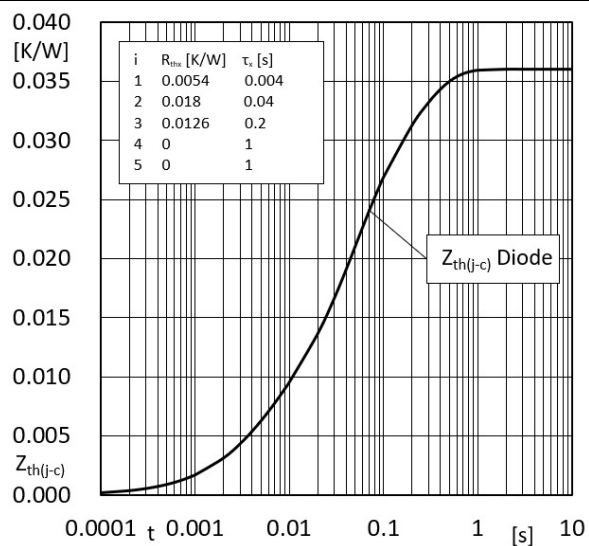


Fig. 10: Transient thermal impedance Diode

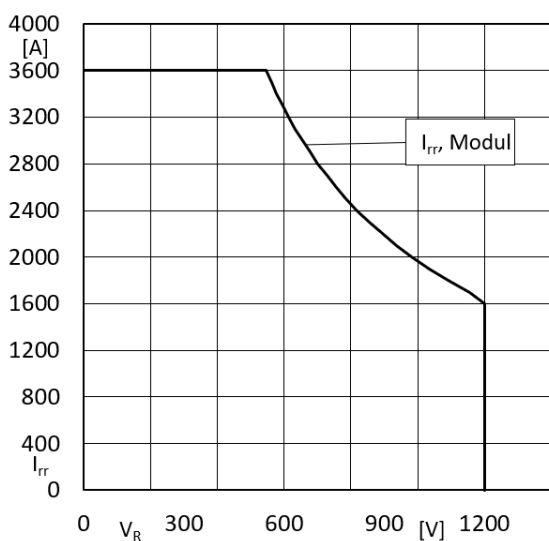


Fig. 11: RBSOA Diode

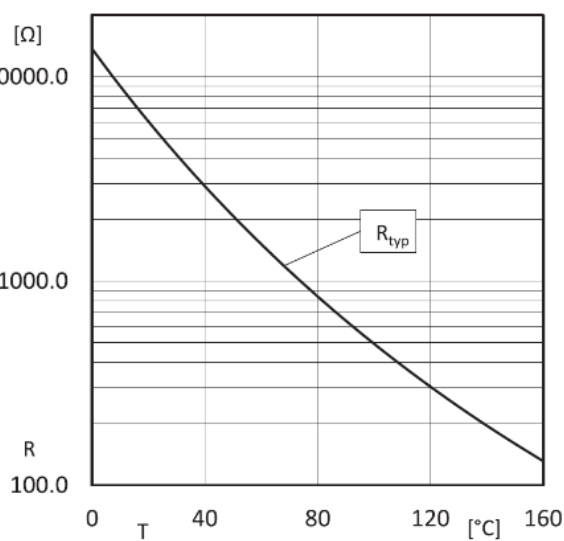


Fig. 12: NTC characteristics (typical)

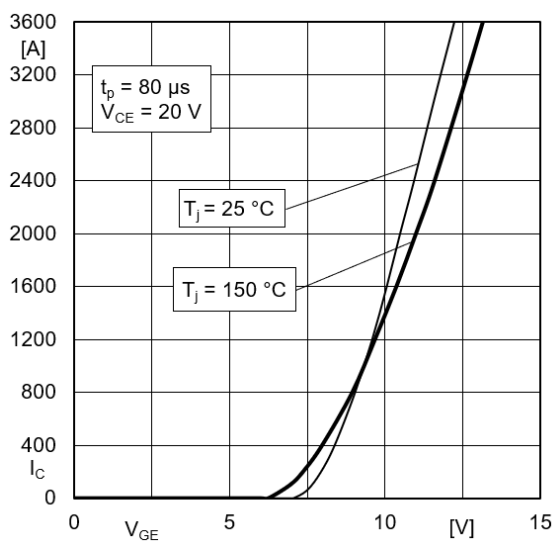


Fig. 13: Typical transfer characteristic

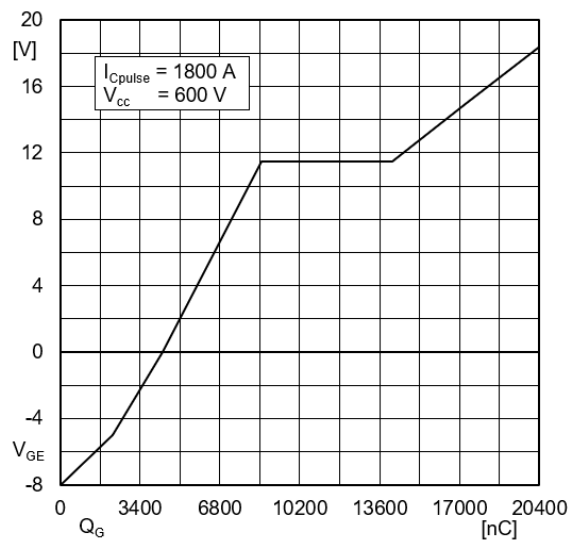
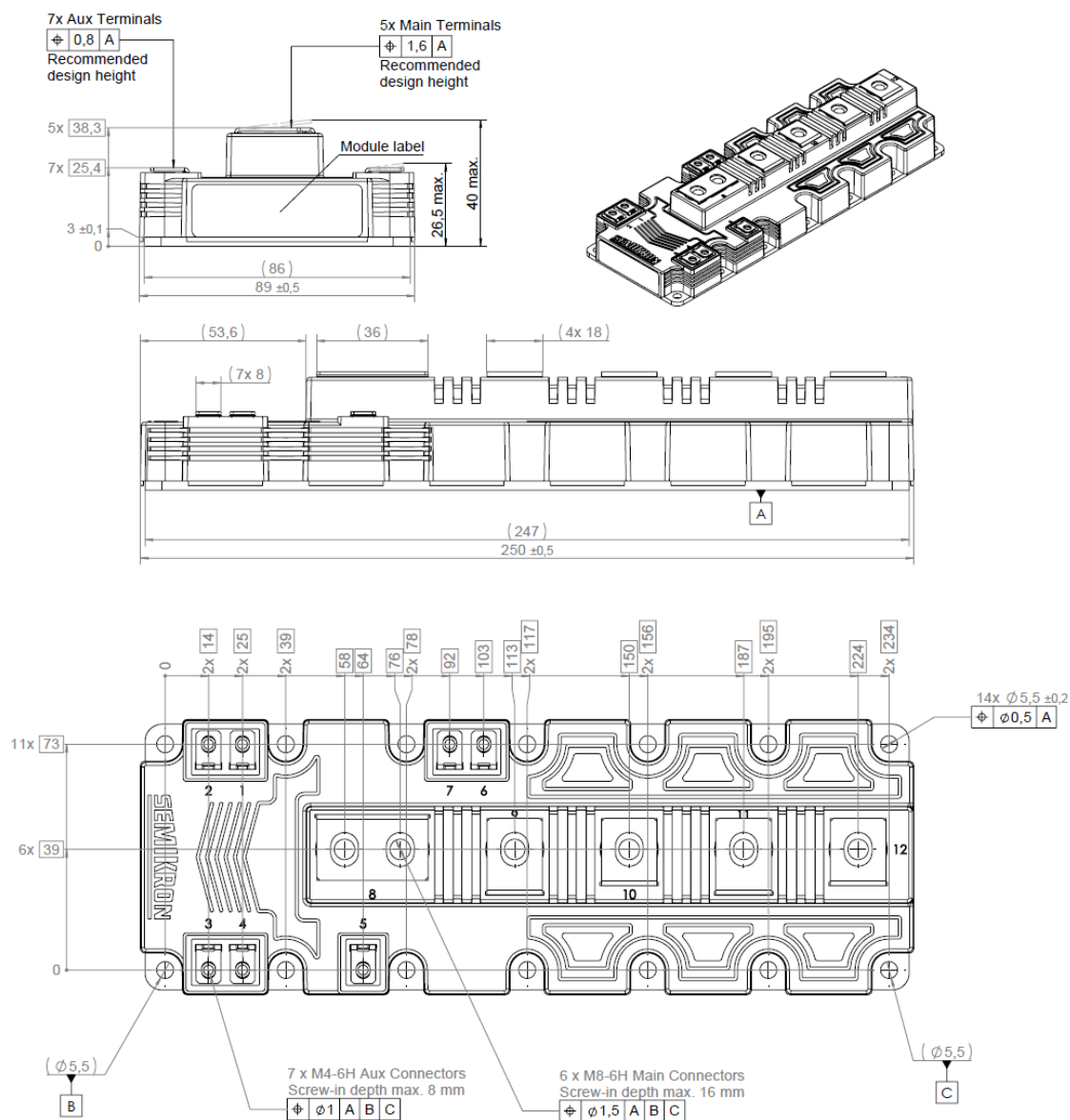


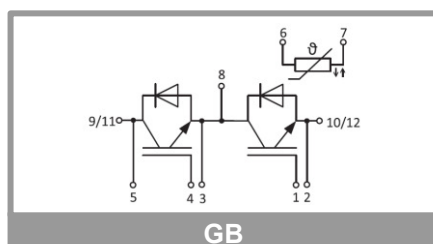
Fig. 14: Typical gate charge characteristic

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- Dimensions in mm
- General tolerances ±0,5mm

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This is an electrostatic discharge sensitive device (ESDS) according to international standard IEC 61340.

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